

# Summative Analyses

Jan Horsky, PhD  
Lena Mamykina, PhD



Usability Workshop at the NIST  
May 22, 2012  
Gaithersburg, MD

# Understanding Usability

- Developers

- ▶ Following structured, reproducible process will lead to better usability characteristics, **competitive advantage**

- Purchasers

- ▶ Informed questions before acquisition will allow product comparison and **create demand** for highly-usable HIT.

# Evaluation during Lifecycle

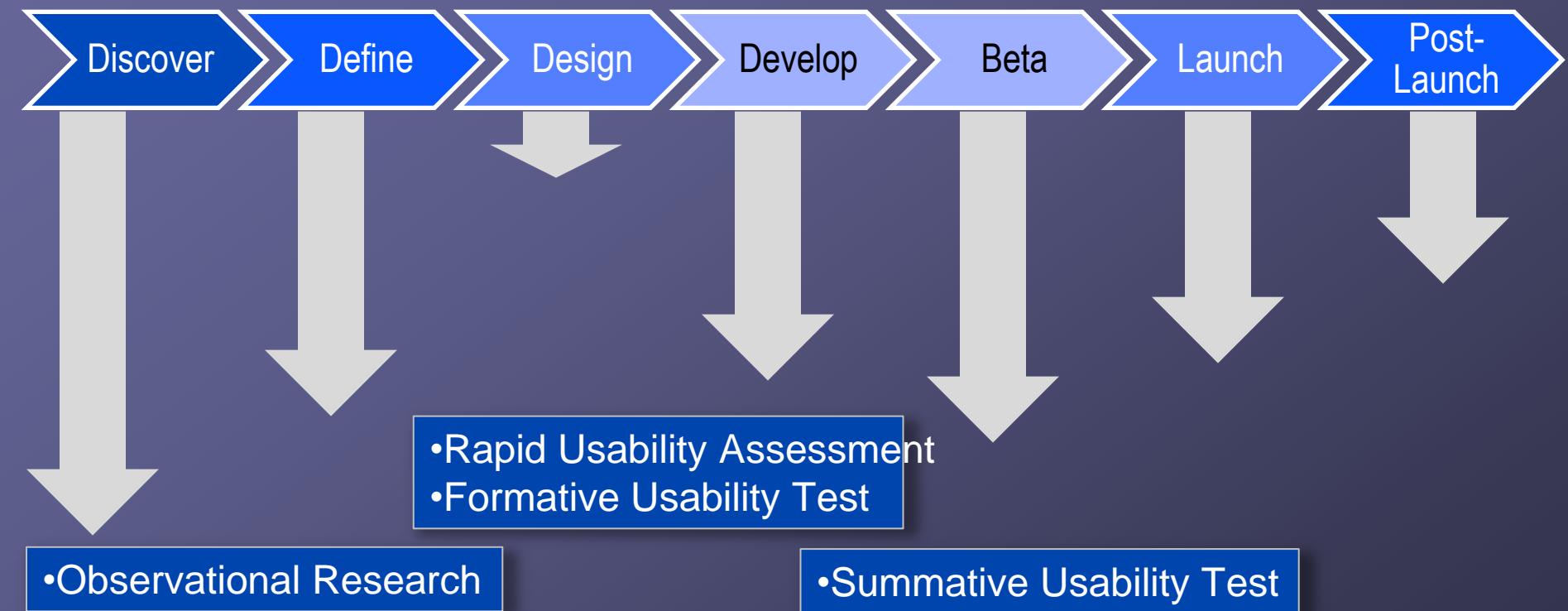
- Formative

- ▶ Small scale (4–6), frequent, early start, qualitative focus, rapid feedback
- ▶ Goal is to test design concepts and ideas, identify opportunities for error

- Summative

- ▶ Larger scale (20), working prototype, quantitative, smaller fixes, workflows

# Design and Test Process



# Summative Testing

- Validation testing used to establish baselines, measure the application against benchmark or competing applications, and/or to validating the application is ready for launch.
- Validation testing may also be necessary when the vendor must provide formal evidence of testing.

# Summative Testing

- Done later in the design cycle with larger and more diverse groups
  - Generalists/specialists, levels of expertise, different conditions.
- Gathers human performance data
  - Completion rate, optimal strategies, delays, errors, time, quality of output

# Summative Testing

- Focus on critical interface design issues that may affect patient safety
- Interface supports clinical tasks
  - Effective in aggregating relevant data
  - Effective displays that allow fast and unambiguous interpretation of data
  - Reuse of data, no duplication of effort

# Evaluators

- Clinicians – Subjective
  - Self-reported data in questionnaires, satisfaction, easy/hard, learnable.
- Clinicians – objective
  - Observed in scenario studies, task completion, errors, delays, strategies

# Evaluators

- Usability experts
  - In teams with clinicians identify task structure, cognitive demand, design compliance with known best practices.
- HCI experts
  - In teams with informants, clinicians, evaluate workflow fit, potential for error, issues relating to patient safety

# Summative Testing

- Attention to usability principles
  - Visibility of system status
  - User control and freedom
  - Consistency and standards
  - Help users recognize, diagnose, and recover from errors
  - Minimize memory load
    - Emphasize recognition rather than recall
  - Motivation and engagement

# Scenario-based Studies

- Test interaction with software in real clinical scenarios
  - Observe clinicians complete standard tasks representative of real use
  - Ask them to think-aloud, record their actions and analyze
  - Debrief after tasks and follow-up with semi-structured interviews

# Scenario Testing

- Realistic scenario with a direct task
  - You just admitted an obese (100 kg) patient with obvious DVT rule out pulmonary embolus. Because she may go for pulmonary angiography, you decide to anticoagulate with heparin. Write the orders for heparin administration.
- Key – expected outcome
  - Heparin 8000 units IV bolus followed by 1500-1800 units per hour continuous IV
  - Stat PTT 6 hours after initiation of heparin infusion

Horsky J, Kaufman DR, Patel VL. Computer-based drug ordering: Evaluation of interaction with a decision-support system. Medinfo; San Francisco 2004. p. 1063-7.

# Think-Aloud Study Example

- Recorded interactions of nurses with a prototype of Acute Care Documentation system
- Violations of design principles
  - Incomplete actions
  - Trial-and-error behavior
  - Errors – lost data or incorrect entries
  - Rate severity – helps to prioritize development effort

# Exercise

- Watch nurses interacting with the system documenting care
- Mark problems and errors
  - Layout, language, errors, delays
  - Record time marker, brief description
  - Discuss possible errors and fixes